Roll No. ☐☐☐☐☐☐☐☐☐☐☐☐☐   Total No. of Pages : 03

Total No. of Questions : 18

B.Tech. (2012 to 2017)   (Sem.–1, 2)
ELEMENTS OF MECHANICAL ENGINEERING
Subject Code : BTME-101
M.Code : 54101

Time : 3 Hrs.   Max. Marks : 60

INSTRUCTIONS TO CANDIDATES :
 1. **SECTION-A is COMPULSORY consisting of TEN questions carrying TWO marks each.**
 2. **SECTION - B &C have FOUR questions each.**
 3. **Attempt any FIVE questions from SECTION B& C carrying EIGHT marks each.**
 4. **Select atleast TWO questions from SECTION - B &C.**

SECTION–A

Answer briefly / Fill in the blanks :

1)   Define a Thermodynamics System.

2)   Explain briefly zeroth law of thermodynamics.

3)   What is Triple Point?

4)   Define Internal Energy.

5)   What do you mean by PMM of first kind?

6)   Explain the concept of available and unavailable energy.

7)   What is Air Standard Efficiency?

8)   Define the term True Stress.

9)   Under what conditions the center of mass and center of gravity coincide?

10)   What is the difference between thermoplastic and thermosetting materials?

SECTION-B

11) To a close system 150kJ of work is supplied. If the initial volume is 0.6 m^3 and the pressure of the system changes as p= 8-4V, where p is in bar and V is in m^3, determine the final volume and pressure of the system.

12) 0.1 m^3 of an ideal gas at 300K and 1 bar is compressed adiabatically to 8 bar. It is then cooled at constant volume and further expanded isothermally so as to reach the condition from where it started. Calculate :

   a) Pressure at the end of constant volume cooling

   b) Change in internal energy during constant volume process

   c) Net work done and heat transferred during the cycle. Assume Cp = 4.3 kJ/kg K and Cv = 10.2 kJ/kg K.

13) Write down the general energy equations for steady flow system and simplify when applied to the following :

   a) Centrifugal water pump

   b) Steam nozzle

14) A closed system contains at a pressure 1 bar, temperature 300 K and volume 0.018 m^3. This system undergoes a thermodynamics cycle consisting of the following three processes in series :

   a) Constant volume heat addition till pressure becomes 5 bar,

   b) Constant pressure cooling

   c) Isothermal heating to initial state

   Represent the cycle on T-S and p-V plots and evaluate the change in entropy for each process. Cp=0.718 kJ/kg K and R = 0.287 kJ/kg

SECTION-C

15) An engine of 250 mm bore and 375 mm stroke works on otto cycle. The clearance volume is 0.00263 m^3. The initial pressure and temperature are 1 bar and 50°C. If the maximum pressure is limited to 25 bar, find the following :

   a) Air standard efficiency of the cycle

   b) The mean effective pressure of the cycle, Assume the ideal conditions.

16) Discus briefly the method employed for improvement of thermal efficiency of open cycle gas turbines.

17) Discuss the following properties of the materials :

   a) Ductility

   b) Resilience

   c) Weldability

   d) Plasticity

18) Determine the moment of inertia of a semicircular arc about its diameter and hence locate its centroid.

NOTE : Disclosure of Identity by writing Mobile No. or Making of passing request on any page of Answer Sheet will lead to UMC against the Student.